

# **ON THREE 512K Memory Board**

## **User's Guide**

*Installed 2/22/87  
D9*



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# Guide For Installation

## Overview

The **ON THREE 512K Memory Board** gives your Apple /// a full 512K of memory, the most the machine can directly use. Most programs written for the Apple /// will automatically use the extra memory. But for those that won't, utility programs are provided to update all of your Apple /// disks so almost all of your programs will use the full 512K of memory.

The Apple ///'s *hardware* was designed to use only 256K of memory. So, until the **ON THREE 512K** memory board was developed, going past 256K was impossible. The ///'s operating system (SOS) can support 512K of memory, but with the manufacturer-imposed hardware limitation, it was unable to. Until now.

Through a clever design, the **ON THREE 512K** memory board brings your programs the capability of using 512K of memory. In addition, utility disks are provided to not only check your 512K memory board after installation but also use a portion of your 512K of memory as a very fast disk drive. The **RAMDISK** is optional, so if you want to have a lightning fast disk drive, you can!

## Installation Instructions

Your **ON THREE 512K Memory Board** upgrade contains the following items:

- 1) Apple /// 512K Memory Board.
- 2) C12 PROM
- 3) EX-1 Integrated Circuit Extractor.
- 4) Diskette : **512K Memory Test** (Side 1).  
                  : **Upgrade Data** (Side 2).
- 5) Diskette : **UPGRADE.TO.512K** (Side 1).  
                  : **System Utilities 1.2** (Side 2).
- 6) Diskette : **RAMDISK.DEMO.1** (Side 1).  
                  : **RAMDISK.DEMO.2** (Side 2).

Installing the 512K memory board is straightforward and should take no longer than one hour. After reading this, you should have no reservations about the installation. However, if you do, please bring your machine to your dealer. However, you will no doubt be charged for the installation.

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To accept the 512K memory board, your Apple /// must be a 256K machine or a 128K machine with the newer 5 volt memory board. If not, contact **ON THREE** or your dealer to arrange an upgrade to 256K.

In addition to the parts provided with the upgrade kit, you will need the following items to install the 512K memory upgrade:

- 1) Number 2 Phillips-head screwdriver.
- 2) Standard 1/4 inch screwdriver.
- 3) Six blank diskettes.

Before starting the installation process, make copies of the three diskettes supplied with the 512K memory upgrade using the System Utilities Program supplied with your Apple ///. Each disk supplied with the upgrade is *double-sided*, and since you cannot normally copy onto both sides of a diskette, you must back up each side of the supplied disks on its own disk.

First, make a copy of the front side of the 512K Memory Test disk. Label it **512K Memory Test**. Next, copy the back side of the 512K Memory Test disk onto the front side of another of your diskettes and label it **Upgrade Data**. Follow the same procedure for copying all of the other disks supplied with the upgrade. When instructed to use a diskette, always use your back up. If one fails, you will always have a master diskette intact to use for making more copies.

To begin, save any file you are currently working on and then turn the power to your Apple /// off. Detach all power cords and video, disk drive and other interface cables.

Turn to page 106 of the *Apple /// Owner's Guide* and follow the instructions for removing the cover and peripheral cards. Even if you don't have any peripheral cards in your Apple ///, remove the cover and any dummy cards following the guide's instructions.

If you have a clock in your Apple ///, disconnect the battery cabling before proceeding. If you have an **ON THREE O'Clock**, simply disconnect the cable by snapping off the end of the battery pack. If you have another clock, disconnect the cabling in a similar manner.

## Opening Your Apple ///

To install the 512K memory upgrade, first remove the bottom plate of your Apple ///. Carefully turn your computer over so that you can see the bottom. The plate which we will remove holds your machine's model and serial number. There is also a smaller metal plate on the bottom of your /// which covers the power supply; do not remove that. Now locate and remove all the Phillips-head screws fastening the large plate to the shell. Use the Phillips-head screwdriver. Be sure you keep all the screws in one place because you will need them to reattach the bottom plate later. Facing the computer so the keyboard is upside down and closest to you, gently lift the left edge of the plate about an inch or so. As you lift the bottom plate, you will see two blue ribbon cables. They connect the keyboard and the disk drive to the main circuit board of the Apple ///. These must be removed. To do that, carefully loosen and disconnect them by slowly rocking them back and forth in their sockets.

After the cables are removed, continue lifting the left side of the bottom plate. As you do, you will see a small twisted black cable attached to the main circuit board. This is the cable to the internal speaker. Unplug it. And don't worry about pairing the same male and female connectors when you reattach it. The connection is not polarized and it will work either way you insert it.

If you have an Apple clock, there will be a battery cable attachment about halfway across the main circuit board. Disconnect it by pulling on it gently. If you have an Apple /// or an Apple /// plus with the interlace kit installed, located very close to the battery cable attachment is another cable attachment that looks very much like the one on the battery cable. Disconnect it in a similar manner.

You have now disconnected all of the cables except one. Pull the left edge up so that it is perpendicular to the computer casing and you will see a cable attached to the right side of the main circuit board. This is the power supply cable. Carefully reach in and unplug it. Don't worry about electrical shock because everything is insulated and you unplugged the machine before beginning, as instructed earlier.

Now that you have unplugged this last cable, turn over the main circuit board so the computer chips are right-side up. All of the cables attaching the main circuit board to the computer chassis should now be disconnected. Lay this assembly down next to the computer and continue.

## **Removing The Old 256K Memory Board**

You should now be looking at the innards of the Apple /// computer. Notice that sitting on top of the main circuit board is another circuit board; this is the Apple /// 256K Memory Board. It is attached to the main circuit board by two, 25-pin connectors, one at each end.. You must remove the old 256K memory board before inserting the new 512K board. To do so, follow these next instructions very carefully.

You will disconnect one side at a time without lifting the side more than a short distance from the 25-pin connector. If you lift one side too far away while the other is still attached, you will bend the 25-pin connector and make it very difficult to install the new 512K memory board.

Remove the left side first. Place your left hand on the part of the 256K memory board closest to you and your right hand on the part of the board that is farthest from you. Gently rock the board upward. Depending on how old your machine is, the board may be somewhat sticky. It may take some tugs to get the one side off of the 25-pin connectors.

Once you have the left side removed, put your left hand on the edge farthest away from you and your right hand on the edge closest to you. Again, gently rock this edge upwards until it comes off of the 25-pin edge connector. As soon as it is off, place the 256K memory board down on a dry, flat surface. You should now see the main computer board. It requires a few modifications before it can work with the new 512K memory board you will attach later.

## **Removing The Old Memory Chips**

To enable the computer to use the new memory board you soon will install, you must change the chips on the main computer board which handle memory addressing. These chips, called PROM's, control the way the memory found on the new board is used by the Apple ///. Since the design of the 512K memory board is very different from that of the 256K memory board, four memory-addressing PROM's on the main computer board must be changed.

If you look closely at the main computer board, you will see that it is labeled with index numbers and letters. Starting at the left front corner you will see small white lettering that says A1. These numbers tell you each chip's location, so you should familiarize yourself with them.

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Locate the EX-1 Integrated Circuit Extractor. It is the horseshoe-shaped, black metal device provided with the 512K memory board. Find the computer chip located at **C11**. On the chip are small numbers and letters. One set of numbers reads **342-0061** or **341-0061**. Place the curved ends of the extractor tool around the chip which sits in a socket on the main computer board. Be careful to place the tool around the computer chip *only* and not the socket. Gently pull up the chip.

Use a similar procedure to remove the PROM's at locations **C12** and **C13**. The computer chip at **C12** will be labeled with the numbers **342-0056** or **341-0056**. The computer chip located at **C13** will be labeled with the numbers **342-0063** or **341-0063**. Remove all three of these chips and set them aside.

### **Removing The 6522 At 'B4'**

Since the Apple /// hardware was designed to use only 256K of memory, a few additional addressing lines must be changed on the main computer board. With new addressing lines, the computer can use the full 512K of memory. One of these addressing lines is located on the 6522 computer chip located at **B4** on the main computer board.

This is the third large chip from the left in the row of computer chips closest to you. To remove this chip, first locate the standard 1/4 inch screwdriver. Place the flat head of the screwdriver between the computer chip and the chip's socket. Point the screwdriver's flat head away from you and toward the chip you will remove. Be careful not to put pressure on any of the small, blue-tipped capacitors located near this chip.

Gently slide the screwdriver under the 6522 chip at **B4** and slowly lift the 6522 from its socket. Be careful not to bend any of the metal pins coming from the 6522 chip as you remove it. After you have lifted most of the chip out of the socket, use the Extractor Tool to lift the 6522 chip completely out of the socket and place the chip on a flat surface.

### **Installing The New PROM At 'C12'**

One of the new memory addressing chips is located at **C12** on the main computer board. This next procedure will guide you in installing this chip. To start, place one piece of the white protective shipping foam on the table near the computer. Pick up the 512K memory board. It is wrapped in plastic anti-static wrap. Be very gentle with this package.



Reach into the package and remove the memory board. While holding the memory board with one hand, place the plastic anti-static wrap on the piece of white shipping foam. Now, place the 512K memory board on the plastic anti-static wrap.

Look at the 512K memory board assembly. Attached to the anti-static black foam are four items. From the left, the first and largest of these is the 40-pin jumper assembly that will plug into the socket at **B4**. The next item is a ribbon cable assembly that will plug into the socket at location **C11**. The next is the new PROM to be located at **C12**. The last item is the PROM and cable assembly that will be at location **C13**.

Remove the **C12 PROM** from the anti-static foam with the Extractor Tool. As you lift it away from the black anti-static foam, look at the attached metal pins. Make sure none of the pins is bent. If one is, hold the chip in one hand while gently moving the pin back in line. If a pin is bent very badly, use a pair of needle-nosed pliers to straighten it.

Using the Extractor Tool to hold the chip, place the **C12 PROM** in the socket at **C12**. The little arrow on the top of the chip should point toward you as you insert it. Align the pins on the **C12 PROM** chip with the holes in the socket. With your fingers, slowly push the chip into the socket while making sure you do not bend any of the pins. The chip must be seated straight and firmly in the socket before you continue.

### **Installing The New 512K Memory Board**

You are now ready to install the 512K memory board assembly onto your computer. Look at the two 25-pin connectors that held the old 256K memory board in place. Make sure that each of the 25 pins on both sides are straight and not bent. If any are bent, use either your fingers or a pair of needle-nosed pliers to straighten them.

To insert the 512K memory board, pick the left edge of the board up with your left hand and the right edge up with your right hand. Hold the board by the white 25-pin edge connectors. The black piece of anti-static foam will still be attached to the cabling assemblies which are connected to the 512K memory board.

If you gently turn the 512K memory board assembly over, you will notice 25 holes on each end of the board, directly underneath the white edge connectors. You will be aligning these holes with the pins on the main computer board.

**THE NEXT STEP IS VERY IMPORTANT, FAILURE TO FOLLOW  
THE DIRECTIONS TO THE LETTER COULD DAMAGE THE  
512K MEMORY BOARD AND/OR YOUR APPLE ///.**

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Hold the 512K memory board assembly in the approximate position over the pins, moving the 512K memory board's white, left-edge connector over the 25 pins emanating from the main computer board. Gently move the edge connector over the 25 pins until they align. Push slightly down on the left edge so that it will hold in place. Do NOT push down all the way at this time.

**AT NO TIME ARE YOU TO PRESS THE MEMORY BOARD ASSEMBLY DOWN BY PUSHING DOWN ON THE MIDDLE OF THE BOARD. ONLY APPLY PRESSURE TO THE WHITE EDGE CONNECTORS. IF YOU HAPPEN TO PUSH DOWN ON THE MIDDLE OF THE BOARD, YOU WILL PROBABLY DAMAGE THE 512K MEMORY BOARD ASSEMBLY.**

Moving now to the right side of the 512K memory board assembly, place the right-edge connector over the right 25 pins until they align. Push slightly down on the right edge so that it will hold in place. Look again at the left side of the board assembly. It is possible that while attaching the right side, the left side may have come off. If this is the case, re-align the pins so that both sides are aligned, semi-inserted and ready for final installation.

When both sides are aligned, use your left and right hands to simultaneously push down on the left and right edges of the memory board. It may take a bit of gentle force to seat the edge connectors firmly on the pin connectors.

#### **Installing The Jumper Assembly At 'B4'**

Attached to the 512K memory board is a 40-pin jumper socket assembly which plugs into location B4. Gently remove the 40-pin socket from the black anti-static foam using your hand, not the extractor tool. Note that the wire attaching the 40-pin socket to the 512K memory board is connected to pin 5 on the 40-pin socket.

Move the 40-pin socket assembly over the socket at location B4. The wire attaching the jumper socket to the 512K memory board will be on the right side of the socket, near you. Align the pins on the 40-pin socket assembly with the holes of the socket at location B4.

Slowly push the 40-pin socket assembly down into the socket at B4. Push down on the edges of the 40-pin socket assembly, not the center, and do not bend any of the pins. The 40-pin socket assembly must be seated firmly in the socket at B4 before you continue.



## **Re-installing The 6522 At 'B4'**

Now that you have installed the 40-pin jumper assembly you can re-install the 6522 chip. Look carefully at the top of the 6522 chip. There is a small notch on one side of the chip. Place this side nearest to you when you reinstall the chip.

Align the pins of the 6522 chip with the holes of the socket at location **B4**. If any of the pins are bent, bend them back into place and then continue. Slowly push the 6522 chip down into the socket. Make sure that the chip is seated straight and firmly in the socket assembly before continuing.

## **Installing The Ribbon Cable Assembly At 'C11'**

Remove the jumper cable assembly **C11 CABLE** attached to the 512K memory board from the black anti-static foam. While holding the **C11 CABLE**, remove the **C13 PROM** from the black anti-static foam. Place the foam on a table nearby. Make sure the pins on the jumper cable assembly are not bent. Straighten them carefully if they are.

The **C11 CABLE** has 16 pins, while the **C11 SOCKET** has 18 pins. Insert the **C11 CABLE** into the forward 16 holes in the socket on the main computer board (also called a motherboard). Be very careful not to bend any of the pins as you install the **C11 CABLE** assembly. Check that the **C11 CABLE** is plugged into the socket and that the cable assembly is seated firmly in the socket before you continue.

## **Installing The New PROM Cable Assembly At 'C13'**

You will next install the chip and cable assembly labeled **C13 PROM** in location **C13** on the main computer board. While holding the PROM and cable assembly labeled **C13 PROM**, align the pins of the **C13 PROM** with the holes of the socket located at **C13**. Slowly push the **C13 PROM** assembly down into the socket, making sure you do not exert any pressure on the wires attached to the 512K memory board.

## **Making Sure Everything Is Connected Correctly**

You have now finished installing the 512K memory board assembly. Simple, wasn't it? But before you re-assemble your Apple ///, make sure everything is connected correctly.

Look at both sides of the 512K memory board where it attaches to the pins of the main computer board. Make sure the 512K memory board is correctly seated on those 25-pin edge connectors.

Next, look at location **B4** on the main computer board. The 6522 chip should be sitting on the 40-pin jumper socket assembly sitting in the socket at **B4**. A wire should attach the 512K memory board to the 40-pin jumper socket on the right side of the socket.

Now locate **C11** on the main computer board. There should be a ribbon cable assembly from the 512K memory board attached here. At **C12** on the main computer board there should be a chip labeled **C12 PROM**. At location **C13** on the main computer board, there should be a PROM cable assembly labeled **C13 PROM**. On all of the items at locations **C11**, **C12** and **C13**, the small arrows should point toward you.

Now that you have correctly installed everything according to the above instructions, finish the installation by putting the machine back together as described below.

### **Replacement Of The Bottom Plate**

Now you are going to reconnect the computer's bottom plate to its casing. Place the left edge of the main computer board/bottom plate assembly on the edge of and perpendicular to the computer casing. Reinstall the power supply cable and make sure that all the pins are correctly connected to the cable.

Slowly lower the bottom plate to its original, correct position. When there is enough slack in the cables, reattach the speaker cable to the speaker connector located near **M12**. The speaker cable emanates from the speaker. Next, reattach the shorter of the two ribbon cables to the connector at the very rear of the main computer board. This shorter ribbon cable is attached to the built-in disk drive.

Now, reconnect the longer ribbon cable to the other connector located near **J7**. This longer ribbon cable is attached to the keyboard. Make sure this and the disk drive cable are seated firmly in their sockets. If you have an Apple clock, reconnect the battery cable to the main computer board. If you have an **ON THREE O'Clock**, make sure the battery cabling is routed correctly through the peripheral card well.

If you have an Apple /// or an Apple /// plus with an interlace kit installed, you must reattach the interlace's cable. This is located very close to the section of the computer where the clock battery supply is connected.

Now that all the cables are connected, finish lowering the edge of the bottom plate onto the computer casing. Align the screw holes on the bottom plate assembly with the screw holes in the computer casing. Reinstall the screws to hold the bottom plate assembly to the computer chassis making sure they are tight.

You may now turn the computer over so it is sitting right-side up. If you have a clock in your Apple /// with a battery back up, reattach the cabling to the battery pack. Before replacing any interface card you have removed, use the following instructions to run a test of the 512K memory upgrade.

### **Testing The 512K Memory Board**

Connect the power cable to your Apple /// and the video cabling to the back of your machine. Turn the power to your monitor on. Locate the diskette labeled **512K Memory Test**. Place it into the internal drive of the computer and turn the machine's power on.

The light to the disk drive should come on for a second or so and the 512K memory test will commence. The program will check all of the Apple ///'s memory for possible errors. If the test program does not run, there may be a few things causing this. If the light on the computer is on, one of the cables attaching the 512K memory board to the main circuit board is either disconnected or incorrectly attached.

If the light on the computer comes on but the disk drive does not come on, the disk drive cabling is probably disconnected. If the light comes on and the disk drive turns on for a second or so but nothing appears on the monitor, check the cables attaching the monitor to your machine.

If the light doesn't come on, check to see that the power cable to the Apple /// is attached correctly. If it is, then the power supply cable connecting the power supply to the main computer board is probably disconnected.

If the 512K memory-testing program runs but then fails after a minute or so, one of the cables connecting the 512K memory board to the main circuit board is probably disconnected. If the test program shows bad areas of RAM, contact **ON THREE** for further information.

If you have any RAM failures or any other problems, call **ON THREE** at (805) 644-3514 from 9:00 a.m. to 5:00 p.m. Pacific Time.

If the 512K memory-testing program successfully makes a number of passes in checking the Apple ///'s memory, turn the computer off and follow the rest of these instructions for reassembling your system.

Follow the instructions in your Owner's Guide for reinstalling any of the peripheral cards you may have removed. Reconnect all of the power, video, disk and other interface cables. Now replace the cover and you are ready to use your system again!

Once everything is put back together, reboot the diskette labeled **512K Memory Test** and let it run for 30 minutes. After about 15 minutes, the computer will reach its maximum operating temperature and the memory board will have been thoroughly tested over a wide range of temperatures. When the test program has run for the full 30 minutes, you can be assured that everything on the 512K memory board is working correctly. Now you can pack up your old 256K memory board and send it back to **ON THREE** as described below. After packing up your old board, continue with the instructions in the section, "Guide For Use."

### **Packaging Your Old 256K Memory Board**

As soon as your new 512K memory board is working correctly, place the three old chips removed from locations **C11**, **C12** and **C13** onto the black anti-static foam. Next, place the old 256K memory board into the anti-static plastic wrap that held the 512K memory board. Also place the black anti-static foam with the three old chips attached into the wrap.

Place the 256K memory board assembly into the packaging the 512K memory board came in. Place the EX-1 extractor tool into the box also. Be sure you sandwich the memory board assembly between the two pieces of white foam. Use the enclosed mailing label to mail the old board back to us. Upon receipt of the old board, we will mail you a refund check for \$25 or give you a credit of \$35 toward any future products from **ON THREE**. Insure the package for \$50 to assure your old memory board reaches us. Specify your refund choice by using the enclosed order form.

# Guide For Use

## Overview

These instructions will help you use the 512K Memory Board with all of your Apple /// SOS programs. By using the included update programs, almost all of your Apple /// programs will be able to directly use the extra memory afforded by the 512K memory board.

## Using The Update Programs

The diskette labeled **UPGRADE.TO.512K** contains all of the update programs you will need to make the 512K Memory Upgrade work with almost all of your Apple /// programs. Now that you have installed and tested your 512K memory board, use these update programs to make the appropriate changes to all of your Apple /// program disks.

If one of your programs (see notes below on the VisiCalc programs) does not appear to be using the full 512K, you probably have not run the appropriate update program yet. Your existing programs have to be updated before they can take advantage of the 512K memory upgrade. If you don't update your programs, they will work just as if they were running on your old 256K Apple ///.

Start up the **UPGRADE.TO.512K** diskette and note the menu. It lets you select various update programs. You may use the General Update program, the VisiCalc Update programs, the Apple Writer Update program and the /// E-Z Pieces Update. You can also run the System Utilities Program or even the RAMDISK demonstration that shows how fast the RAMDISK is.

To select an item on the menu, use the arrow keys to move the highlight over the update you want and press **RETURN**. To back out of a submenu, press **ESCAPE** and you will return to the previous menu.

Each of the update programs are self-explanatory. They will ask you to place the disk to be updated into the built-in disk drive and to press **RETURN**. When you want to leave that update, put the **UPGRADE.TO.512K** diskette into the built-in disk drive and press **ESCAPE**.

If you ever get the message:

**Unable to find: .D1/SOS.MENU,**

place the **UPGRADE.TO.512K** diskette into the built-in disk drive and press the **SPACEBAR**.

### Special Notes On **SOS 1.3 (S)**

You may have noticed upon loading the Update Program that a message appears on the screen saying it is version 1.3(S) of SOS. This is not an update to the regular version 1.3 of SOS; this is a special version of SOS used only by the Selector utility on that disk. Your disks will not work if you transfer the new **SOS.KERNEL** file to them.

### Using System Utilities 1.2

Located on the menu is the System Utilities (version 1.2) Program. Before moving the highlight over this item and pressing **RETURN**, you must put the diskette labeled **System Utilities 1.2** into the built-in disk drive. When you want to Quit the System Utilities Program, put the **UPGRADE.TO.512K** diskette back into the built-in disk drive first.

This version (1.2) will allow you to build larger **SOS.DRIVER** files. Version 1.1 of the utilities program has trouble building driver files which occupy more than about 42K of memory. It creates them well, but the next time you try using the Configuration Program to read it back in, an error message appears saying, "**Badly formatted driver file.**" If you use Version 1.2 you will be able to build **SOS.DRIVER** files which reach the 51K limit of the Configuration Program.

However, System Utilities Version 1.2 will not boot by itself; you must select it from the upgrade menu. To make a disk that will boot alone, do the following:

- 1) Make a copy of your regular system utilities disk and give it the volume name **/UTILITIES1.2**.
- 2) Delete the file **SYSTEM.STARTUP** from the copy you just made.
- 3) Copy the file **UTILITIES.CODE** from the System Utilities 1.2 disk to this new disk. When you copy the file, give it the name **SYSTEM.STARTUP**.

You now have a bootable System Utilities 1.2 disk. If you are using Catalyst or Selector, you can simply copy the **UTILITIES.CODE** file from the System Utilities 1.2 disk to your hard disk and set up an item on your menu for that program. The System Utilities 1.2 is a simple Pascal program and may be installed under both Catalyst and Selector by following the instructions in the respective utilities' manuals.

### Using Business Basic v1.23Ax

To use Business Basic v1.23Ax, first make a copy of your Business Basic master disk. Then copy the file **BASIC.RTINTERP** from the **UPGRADE.TO.512K** disk to the newly created copy of Business Basic. Name the new file **SOS.INTERP**. If you boot this disk you will be running under version 1.23Ax. The **SOS.INTERP** file is the only one that must be changed.

If you are using Catalyst or Selector, simply copy the **BASIC.RTINTERP** file from the **UPGRADE.TO.512K** disk to your hard disk and set up an item on your menu for that program. The file is an interpreter program and may be installed under both Catalyst and Selector by following the instructions in their respective manuals.

The differences between this new version 1.23Ax and all previous versions of Apple /// Business Basic are as follows:

- 1) Your program may now use more than 64K of memory. No longer will you have to split a large program into separate modules on disk. Array variables are still limited to a maximum of 64K per any given array, but your program may now use more than 64K of memory.
- 2) There is a new reserved string variable with the name **PROGPREFIX\$**. It is a second prefix in the system and anytime you **LOAD**, **SAVE**, or **CHAIN** a Basic program, the system will use this prefix.

**NOTE:** Be careful in adapting any current software to use this new variable as the above operations do not work as they did before; they now use the **PROGPREFIX\$**.

- 3) Listing a directory (**CATALOGing**) is slightly different. There is a blank line separating the file names from the heading. Because previous versions did not have this line, some programs which scan a directory for files may not work the same with this change.



- 4) Some speed improvements and bug fixes which are not documented.

Again, please note that there is still a limit of 64K on the total amount of string variables used by your program. While you may have more than one 64K real or interger array, you can only use a total of 64K of string data.

### **Special Notes On The VisiCalc Programs**

While we have been able to get the VisiCalc programs to work with the 512K Memory Upgrade, there is a small problem. Because VisiCalc's creators assumed they would never have more than 256K of memory available, the memory indicator will sometimes be wrong.

The memory indicator will be blank until the program has less than 256K of memory. As you fill your spreadsheet and reach a point where there is less than 256K of memory available to the system, the memory indicator will come on and work correctly. As soon as there is more than 256K of memory available, the memory indicator will go blank again.

When working with the Advanced VisiCalc program the situation is a bit more confusing. When you first start up the program, the memory indicator will say there is about 180K free. As you fill up your spreadsheet and the indicator reaches 0K free, it will begin counting over again at 255K of free memory. Thus, to correctly gauge available memory, when the program first starts up add 256 to the memory indicator number. As soon as there is more than 256K of memory used, the memory indicator will go to 0 again and work upwards.

If your VisiCalc programs are acting erratically with the 512K Memory Upgrade, or if they don't work at all, you have not used the correct update program. Make sure that you have used the correct VisiCalc update program and when prompted have answered the question about the RAMDISK correctly. After doing this the VisiCalc programs will work correctly.

### **Special Notes On /// E-Z Pieces**

After using the /// E-Z Pieces update, your /// E-Z Pieces program will have a maximum of a 414K desktop. That's the maximum amount of memory the program has available after loading in. There are a couple of slight problems with /// E-Z Pieces that will be explained in the next few paragraphs.



When loading, saving, or listing /// E-Z Pieces files, the /// E-Z Pieces program will not correctly list certain files. If your file exceeds 255K of memory, the program will list its size as whatever value it is minus 255. Thus, if your file uses 300K on disk, the /// E-Z Pieces program will show it occupying only 45K on disk. This in no way affects the operation of the program when you load or save files to or from the desktop. It only appears on file listings.

If your desktop was empty (414K of free memory) and you loaded that 300K file, you would have about 114K of memory still on your desktop. It will be your responsibility to keep track of your very large files. When you remove the large (300K) file from your desktop, you will again have 414K of memory.

### **Notes On Using Your 512K Apple /// With Catalyst**

After using the General Update utility provided with your 512K Memory Upgrade to update your Catalyst diskette, most programs running under Catalyst will have more memory. If you were having problems running some Pascal programs such as Keystroke or the BPI System under Catalyst, they will be solved. If you want to use the extra memory with your /// E-Z Pieces program, make sure to use the /// E-Z Pieces update utility. This will update that program to work with the extra memory.

If you are going to use the RAMDISK with Catalyst, please take note of the instructions for installing the RAMDISK driver in the section **Using The RAMDISK**.

### **Notes On The Updated Version Of Apple Writer ///**

When you use the Apple Writer Update program you will be asked to insert your original Apple Writer /// disk into .D1. The upgrade program simply checks that you have a legal copy of Apple Writer before creating a new master copy containing the updated version of Apple Writer. This process in no way affects your original Apple Writer /// disk. Apple Writer files are interchangeable between all versions, so if you later decide to use the original version, you will have no problems (other than possibly breaking up a large file into two or more pieces).

The updated version of Apple Writer /// contains a number of interesting features not found in the standard version of Apple Writer ///. This version supports the full amount of memory in the Apple /// system. It also supports a variable column width of up to 255 characters. These features can be accessed by pressing **CONTROL-O**, which presents the SOS Commands menu. One problem with this version of Apple Writer /// is that you can't access the Apple Speller program (Option J on the SOS Commands menu) from within

the Apple Writer program if more than four 32K banks of memory are reserved. There are some instances when you will be unable to run Apple Speller at all. However, you will always be able to use the spelling checker on files created with the new version of Apple Writer. Simply boot the spelling program alone.

When loading a larger file you may notice that, at times, the space the program says the file occupies on disk does not match the space the program occupies in memory. When loaded into memory, the files use a bit more room than indicated on disk. For example, a 51K data base file on disk may take 53K of memory on the desktop. A 284K word processor file on disk may take 308K of memory on the desktop. The larger the file, the larger the discrepancy. Thus, if you have 200K of memory left on the desktop, don't be surprised that you may not be able to load a 195K file from disk.

There are a couple of built-in limitations of the /// E-Z Pieces program that should be noted:

- 1) There is a 3,000-record limit in the data base portion of /// E-Z Pieces, therefore, the data base files on your desktop may have no more than 3,000 records each. You may create multiple data base files on the desktop each having up to 3,000 records, but none of the individual files may have more than 3,000 records. You should rarely encounter this limitation, unless you are working with very small records, such as those in a mailing list.

The best way to work around this limitation is to divide a large mailing list into two or more sections.

- 2) There is a 3,584-line limit in the word processor portion of /// E-Z Pieces, therefore, the word processor files on your desktop may have no more than 3,584 lines each. You may create multiple word processor files on the desktop each having up to 3,584 lines, but none of the individual files may have more than 3,584 lines.

The best way to work around this limitation is to divide the large word processing document into two or more sections.

#### **Important Note:**

After booting your /// E-Z Pieces program, notice that the first screen contains a message saying **V1.1 512K**. This message is there to assure you that your program has been updated to work with a 512K machine. Don't be

confused by the 512K message. After updating, your /// E-Z Pieces disks will work on an Apple /// of any memory size.

You may notice that after updating you will have 1K less memory on the desktop of your 256K machine. This shouldn't be a problem. If it is, just be sure to use only your original /// E-Z Pieces disks on your 256K Apple ///s and the updated version only on your 512K machines.

## Using The RAMDISK

Part of the 512K Memory Upgrade consists of a new disk drive for your Apple ///, a RAMDISK. The RAMDISK driver allocates 140K of your Apple ///'s memory and uses it as a very fast electronic disk. The RAMDISK is optional, so if you want to have a lightning fast disk drive, you can!

To use the RAMDISK with your programs, add the RAMDISK device driver to the **SOS.DRIVER** file of your Apple /// boot disks. The RAMDISK drivers are located on the disk labeled UTILITIES with the file names **RAM.REGULAR** and **RAM.SEL.CAT**.

If you are using Selector or Catalyst and want to add the RAMDISK driver to those systems, use the System Utilities Program to add the **RAM.SEL.CAT** driver into your Selector or Catalyst **SOS.DRIVER**.

If you want to add the RAMDISK driver to one of your stand-alone programs, simply use the System Utilities Program to add the **RAM.REGULAR** driver into your stand-alone diskette's **SOS.DRIVER** file.

The only differences between the two sets of drivers are in the areas of memory they request. While running under Selector or Catalyst, there is approximately 32K less memory available for your programs than when running the programs using stand-alone diskettes.

THE CONTENTS OF THE **RAMDISK** ARE ONLY PRESENT WHEN THE COMPUTER IS TURNED ON. IF YOU TURN THE COMPUTER OFF OR RE-START THE COMPUTER WITH A NEW PROGRAM BUT HAVE NOT SAVED THE FILES TO EITHER A HARD OR FLOPPY DISK, WHATEVER YOU HAD IN THE **RAMDISK** WILL BE LOST. SINCE THE POWER TO YOUR MACHINE CAN GO OFF AT ALMOST ANY TIME DUE TO AN ACCIDENT (TRIPPING OVER THE POWER CORD, ETC.), MAKE SURE THAT YOU PERIODICALLY COPY THE FILES ON THE **RAMDISK** TO A FLOPPY OR HARD DISK. IF YOU ARE USING A UTILITY SUCH AS

SELECTOR OR CATALYST, YOU CAN STORE FILES ON THE **RAMDISK** DURING THE DAY AND BEFORE GOING HOME, COPY THE **RAMDISK** TO A REGULAR 140K FLOPPY DISK DRIVE. WHEN WORKING WITH SELECTOR OR CATALYST, THE CONTENTS OF THE **RAMDISK** WILL BE PRESENT EVEN WHEN YOU CHANGE FROM ONE PROGRAM TO ANOTHER. THE ONLY TIME THEY WILL DISAPPEAR IS WHEN YOU TURN THE MACHINE OFF OR RE-START THE COMPUTER WITH A NEW SET OF PROGRAM DISKS.

### Customizing The RAMDISK Driver (What To Do If It Doesn't Work)

The RAMDISK driver asks SOS for a 140K memory segment. Since the Apple /// SOS does not allow drivers to allocate memory in the normal manner, an extra step is needed to add the RAMDISK driver to your programs.

In the Device Configuration Block (DCB) of the RAMDISK driver there are a number of option bytes. Among other things, these are used by the RAMDISK driver to determine where to take memory from the system. To maximize the memory available to the rest of your programs, these values should tell the RAMDISK driver to take the memory just below the location SOS loads itself into and uses.

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6
	0	1	2	3	4	5
	---	---	---	---	---	---
0x -	00	0C	3F	0C	9F	00

The first five items in the DCB determine what memory location the driver will use for the RAMDISK. There are two sets of addresses listed in the five items. These addresses are the closest memory locations to SOS's which can be used by the RAMDISK driver. Each address consists of a bank number followed by a page number within the bank. The driver uses these values to ask for 140K of memory starting at the closest or high bank and page and working downward.

When referring to these values, remember that the banks in a 512K Apple /// go from 00 to 0E and the pages go from \$20 to \$9F. This is the standard segment address notation described in detail in the SOS Reference Manual, Volume 1.

The first of the five items in the DCB, called byte 00, is a flag which selects the set of addresses to use. If the value of byte 00 is 00, the first set of addresses will be used (Items 2 and 3, also know as bytes 01 and 02). If the value of this byte is 80, then the second set of addresses will be used (Items 4 and 5, also known as bytes 03 and 04).

If you have added the RAMDISK driver to your boot disks and your system hangs after the SOS message screen comes up, the RAMDISK driver is erroneously using space in memory that SOS requires to operate. To correct this, decrease the number in **byte 02** (or **byte 04** if the second set of addresses is being used) of the DCB by one. This is the high page used by the RAMDISK driver, and lowering it by one should give SOS the room it needs to work.

After decrementing this number, save the new driver configuration and try to re-start the system. If the problem occurs again, keep reducing that number until it works. If the page number reaches **\$20**, begin this procedure again at **\$9F**.

If you have added the RAMDISK driver to your boot disks and your system runs, but you can't access the RAMDISK, then your program is probably not utilizing the full 512K in the system. Make sure you have updated the program you are using with one of the update programs provided with your 512K Memory Upgrade. Otherwise, your program will not use the system's extra memory.

If you want to use the RAMDISK driver on a 256K Apple ///, remember that on that size machine banks **07** through **0E** are not available. You can adjust the high bank and page numbers so that the RAMDISK will use memory in the low 256K (banks **00** through **06**).

### **To Flash Or Not To Flash**

Item 6 in the DCB (**byte 05**) is used to determine if the drive light will be active when the driver reads or writes. A value of **00** in Item 1 (**byte 00**) will cause an asterisk to flash in the lower right corner of the screen. A value of **80** in Item 1 will turn off the asterisk. This is useful in monitoring the RAMDISK as it works.

### **Technical Information On The RAMDISK**

Under a normal memory request to SOS, you can simply ask for a specific number of 256 byte pages (in our case 140K or 560 pages). SOS then allocates an unused segment of memory and returns to where this segment is located in memory.

On the device driver level, you have to queue an event upon **D\_Init** to do the memory request. Unfortunately, SOS does not allocate memory for itself, the drivers or the interpreter until **AFTER** the events are handled. Because of this, if we ask the system to **FIND** a **SEGMENT** of memory for us, it will place us in the middle of SOS, the drivers and the interpreter! Because of this, we have to request memory with a **REQUEST**

**SEGMENT** call that asks for free memory in specific areas. These areas must be free and must not contain any part of SOS, the drivers or the interpreter.

When you start up a program with a RAMDISK driver, you will notice that as the system comes up, the characters on the SOS message screen expand. The reason for this delay is that while SOS is loading, the character set to be used is being downloaded. And since this is an interrupt-driven operation, the RAMDISK is able to format 140K of memory for use as an electronic disk drive at the same time. If you have more than one RAMDISK driver in memory, there will be a noticeable delay in the SOS message screen while the memory used by each RAMDISK is being formatted.

You can load up to three 140K RAMDISK drivers into memory at any one time. However, with 420K of memory devoted to RAMDISK's, there is not much memory left for your programs.

If you wish, you can change the device name of the RAMDISK to any legal SOS device name, such as .D3. Some Pascal programs may not recognize the RAMDISK unless it has the name .Dx, where x is 2, 3 or 4.

### **512K Memory Board Technical Notes**

There is one slight incompatibility between the old 256K memory board and the new 512K system. Due to the way memory was mapped into the addressing space, you can access bank 0 graphics space with either an \$8F OR \$87 X-Byte on a 256K Apple ///. The normal method is to use an \$8F X-Byte.

With a 512K Apple ///, you *MUST* use an X-Byte of \$8F to access bank 0 graphics space. If you use an X-Byte of \$87, you will access data in bank \$7, not bank \$0. Since every program we are aware of uses \$8F addressing, there should be no problem. If you are writing a new Apple /// program, make sure you use the correct \$8F X-Byte when accessing bank \$0 graphics space. This will enable your program to run unmodified on both a 256K and 512K Apple ///.

When writing programs requesting memory from SOS, allow for more than 256K being present in the system. Many programs such as VisiCalc and /// E-Z Pieces were developed under the assumption that there would never be an Apple /// with more than 256K of memory. Developers set up their memory indicators and pointers to deal with free memory of only one byte (0-255). On a 512K Apple ///, there could be as much as 480K or more free memory available for a program. Because of this, have your memory indicators and pointers work with 2 bytes to allow for more than 256K of memory.

## **ON THREE 512K Memory Board User's Guide**